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Want to Increase Dairy Efficiency?

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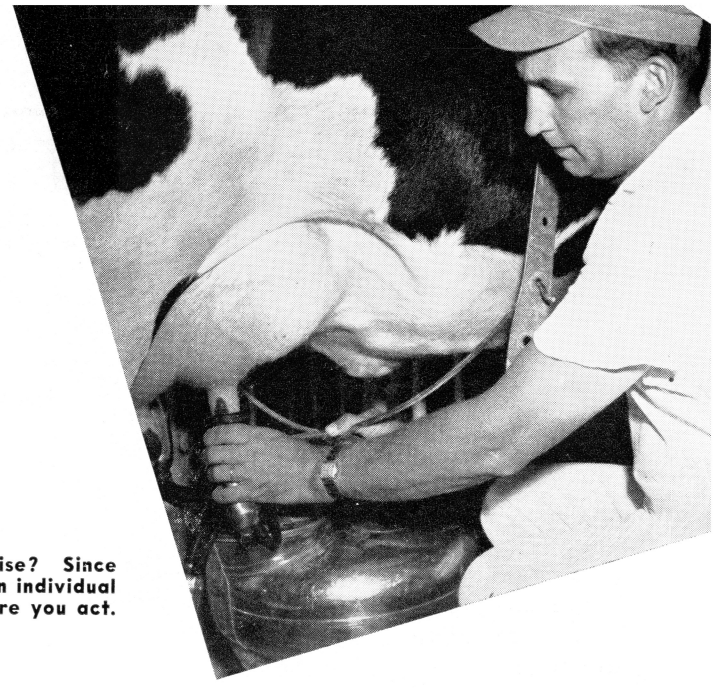

How do you go about increasing efficiency in your dairy enterprise? Since conditions vary from farm to farm, you have to figure out your own individual solution, but here are the things to compare and think about before you act.

by Harald R. Jensen and Earl O. Heady

DAIRYING—more than other livestock enterprises—has felt the pressure of the farm labor shortage and higher wages for available labor. The reason: Labor makes up a greater proportion of total costs for dairying than for other livestock enterprises and has increased in price more than any other major cost item.

But even though dairying involves more labor than other livestock enterprises, feed costs still make up 50 to 55 percent of the total costs in dairy production; labor costs make up 25 to 30 percent of total production costs. Together, feed and labor costs make up 75 to 85 percent of total production costs. So these two items are the first to look at in increasing efficiency. You stand to gain either by feeding more efficiently or by making more efficient use of your labor; if you can do a better job of both, so much the better.

Let's take a look at some of the possibilities for doing a better job in both of these areas:

In Feeding . . .

There are two basic economic problems in feeding. One is to find out the most profitable level or rate of feeding. And the other is to determine the least-cost ration to produce a given amount of milk or butterfat.

To solve the first problem, you need to know three things: (1) the milk output you can expect from different levels of feeding; (2) the cost of different feeds; and (3) the expected price of the product—milk or butterfat.

Research shows that, above a certain point, it takes increasingly more feed to yield a given amount of milk as you feed cows at heavier and heavier rates. Or another way: Above this point, a given additional quantity of feed yields less and less milk as cows are fed at increasingly higher rates. This feed input-milk output relationship holds true for all cows. Some cows, however, are more efficient in converting feed into milk than others.

This relationship between feed input and milk output can help you determine your most profitable level of feeding. No one level of feeding is most profitable at all times. This level will vary with the price of the milk or butterfat and the cost of feed.

Thus, if you're feeding at the most profitable level, and the price of your product—milk or butterfat—increases more than the cost of feed to produce more milk or butterfat, it will pay you to increase your feeding level. But if the cost of feed rises relative to the price of your product, you'll be ahead by reducing your feeding level.

The rule of thumb is: To get the greatest return, continue to increase your feeding level so long as the value of the added output of milk is worth more than the additional feed costs. But go no farther.

Table 1 shows the feed-input:milk-output relationship for a group of cows averaging 350 pounds of butterfat annually. Feed inputs are measured in pounds of total digestible nutrients (TDN). Feed in terms of TDN has been adjusted for different proportions of water and crude fiber and hence represents actual feed. Alfalfa hay, for instance, averages about 52 percent TDN. In the discussion below, feed is considered in terms of TDN. The figures illustrate how the most profitable level of feeding varies with a given price for milk and different feed costs. Column 3 shows the additional feed needed to yield each additional 500 pounds of milk. Columns 5 and 6 show the cost of each additional amount of feed added. Column 7 shows the value of each additional 500 pounds of milk produced.

With feed at 3 cents per pound and milk at 3½ cents per pound, income would be increased by feeding up to at least 7,250 pounds of

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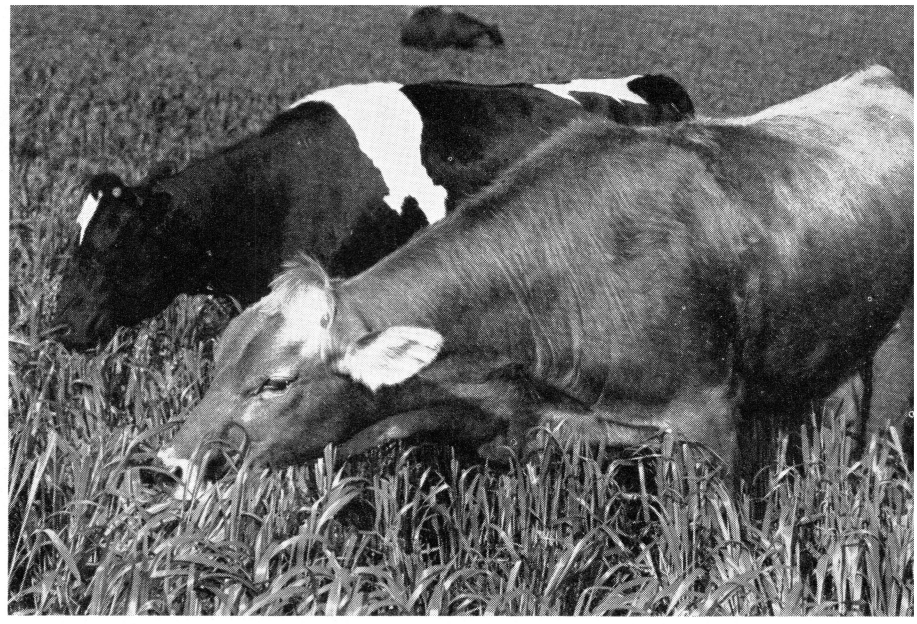
TDN. Up to that point, each increase in feed input adds more to income than is added to costs. When we increase the rate of feeding from 4,900 pounds to 5,125 pounds, $6.75 is added to feed costs, but $17.50 is added to the returns from milk.

Clearly, income would be increased by feeding 5,125 pounds. The table shows that increasing the feeding level adds more to income than to costs until we reach the 7,250-pound level. At this level, almost as much is added to costs as to income. Increasing from 7,250 pounds to 7,905 pounds would add $19.65 to costs but only $16.45 to income. Net income would drop by increasing the feeding level from 7,250 to 7,905 pounds.

With feed at 4 cents per pound and milk at 3½ cents, it wouldn't be as profitable to feed at as high a level as when feed costs were only 3 cents per pound. Here it would be profitable to feed only up to a level of about 6,700 pounds. Up to that level, each added quantity of feed would increase your income more than feed costs. If you were to feed at a higher level, your net income would decrease; more would be added to costs than to income.

So for any group of cows with a given capacity for producing milk, the most profitable level of feeding will vary as the cost of feed changes in relation to the price of milk or butterfat. And, of course, the most profitable feeding level also will vary with the production capacity of the cows.



Feed grains, forages and protein concentrates can be combined in varying proportions to produce a given amount of milk or butterfat. To figure out the least-cost combination, you must consider both the relative costs of the feeds and the rates at which they will substitute for one another.

But in any case, the guiding principle in determining your most profitable level of feeding always is this: It will pay to increase the level of feeding as long as the value of the added milk is worth more than the cost of additional feed. This is true where no other production possibilities exist in use of feed and where capital isn't limited. Where other production possibilities do exist—which is the situation on most farms—your expected returns from your other production opportunities need to be considered in figuring out how far to push the level of feeding for dairy cows.

Ask yourself this question: "If I increase the feeding rate for my dairy cows, will my feed and labor give me greater returns than from other lines of production?"

Least-cost feed combination: There is another point to consider. This is the basic economic problem of the least-cost feed combination in producing milk at the most profitable level of feeding. You can produce a given amount of milk or butterfat with various feed combinations. Feed grains, forages and protein concentrates can be combined in varying proportions to produce a given amount of milk or butterfat.

To find your least-cost combination of feeds, you need to know two things: (1) the relative costs of the feeds, (2) the rate or rates at which one feed substitutes for another. How much can you cut back the amount of one feed as a result of adding a given quantity of another feed—still keeping the amount of milk or butterfat production the same?

For example, three protein supplements—soybean, linseed and cottonseed oilmeals—are used widely in dairy cow rations. Depending upon the kind and quality of forage fed, these protein supplements are of approximately equal value—pound for pound—in the dairy cow ration.

On a pound basis, these three supplements are reasonably close in protein content. Soybean meal contains 40 to 48 percent protein; cottonseed meal, 36 to 45 percent; and linseed meal, 31 to 37 percent protein. So the one costing the least on a pound basis can be used or substituted completely for the

TABLE 1.

Feed-Input: Milk-Output Relationships With Added Costs and Returns for Different Levels of Feeding Under Two Different Cost Situations for Feed and Milk Selling at 3½ Cents per Pound (for cows averaging about 350 pounds of butterfat).[1]

Column: 1	2	3	4	5	6	7
Inputs of feed (lbs. of TDN)	Output of 4% milk (lbs.)	Added feed (lbs. of TDN)	Added milk (lbs.)	Added feed costs at 3c per lb.	Added feed costs at 4c per lb.	Added return from milk at 3½c per lb.
4,900	6,000					
5,125	6,500	225	500	$ 6.75	$ 9.00	$17.50
5,375	7,000	250	500	7.50	10.00	17.50
5,640	7,500	265	500	7.95	10.60	17.50
5,920	8,000	280	500	8.40	11.20	17.50
6,300	8,500	320	500	9.60	12.80	17.50
6,700	9,000	400	500	12.00	**16.00**	**17.50**
7,250	9,500	550	500	**16.50**	22.00	**17.50**
7,905	10,000	655	470	19.65	26.20	16.45

[1]Adapted from Jensen, Einar et al. USDA Tech. Bul. 815, 1952. Input-output relationship in milk production.

others. Table 2 shows the 1944 to 1950 prices per pound of these supplements.

TABLE 2.

Prices Paid by Iowa Farmers for Soybean Oilmeal, Cottonseed Oilmeal and Linseed Oilmeal, 1944 to 1950.[1]

Year	Prices paid per pound for		
	Soybean oilmeal	Cottonseed oilmeal	Linseed oilmeal
	(cents)	(cents)	(cents)
1944	3.05	3.22	2.85
1945	3.04	3.26	2.89
1946	3.90	4.15	3.98
1947	4.85	5.00	4.95
1948	4.89	5.10	4.72
1949	4.26	4.32	4.10
1950	4.27	4.51	4.23

[1]Iowa Crop and Livestock Reporting Service.

Cottonseed meal, during recent years, has been higher priced than the others on a pound basis. It would not have paid to include cottonseed meal in the ration where the three supplements are perfect substitutes. The choice logically would have been between soybean oilmeal and linseed oilmeal. In 1946 and 1947, soybean oilmeal cost the least. In the remaining years, the choice would have been linseed oilmeal.

Labor Efficiency . . .

Next to feed, labor is the most important cost item in dairy production—making up 25 to 30 percent of total costs. And efficient use of labor has become more important—particularly where labor is hired or has other uses.

Total dairy production costs can be reduced by economizing on labor through:

- Substituting equipment for labor when the cost of labor is high relative to that of capital—even though it may take a relatively large amount of capital to replace a given quantity of labor. For instance, a mechanical barn cleaner requires a sizable capital outlay. But in comparison to a wheelbarrow, it saves considerable labor in barn cleaning. Hence, on some dairy farms it may pay to substitute a mechanical barn cleaner for the wheelbarrow. The wheelbarrow, the litter carrier, the center driveway and the mechanical barn cleaners are all substitutes, one for another, in cleaning barns, and involve different proportions of labor and capital.

- Substituting capital for labor when a relatively small amount of capital will substitute for a large amount of labor—even though the cost of capital is relatively high. A milking machine represents a relatively small capital expenditure and saves a large amount of labor.

- Using less labor as a result of more efficient planning. More efficient labor-use planning could result in equipment being handled more conveniently and elimination of unnecessary steps and operations in the milk and chore routine.

Again, the guiding principle can be put into a few words: Substitute one method or practice for another so long as the cost of the method or practice substituted is less than the cost of the method or practice currently in use.

Many Iowa farmers can make considerable savings in labor use through a "job analysis" of the dairy chore routine. One Iowa farmer cut labor requirements in choring nearly 2 hours per day—or an equivalent of 2 man-labor months of work per year. His saving in travel alone was 2 miles per day, or the equivalent of 730 miles per year. And he made this saving at a very low cost through barn rearrangement, improvement of equipment and work routines, and through proper placing of equipment and supplies.

Often labor can be saved at no extra cost. In other instances, costs are involved. Where labor is saved by adding other costs, the extra costs have to be balanced against the value of the labor saved in order to determine whether the saving in labor increases profits.

Sometimes more efficient use of labor doesn't increase other costs directly but still affects the profits earned. For example, at any given milk-feed or butterfat-feed ratio, it will pay to feed higher-producing cows within the herd at a higher level than the lower-producing cows. But this involves time-consuming hand-feeding methods.

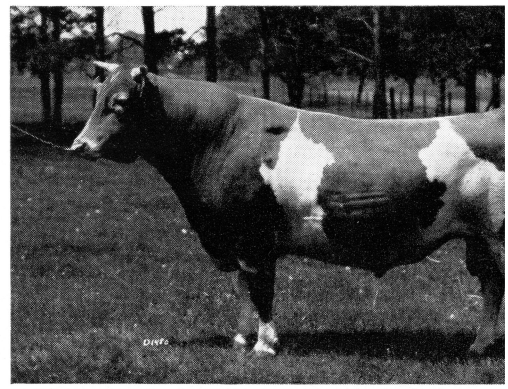
If labor is costly, you may be money ahead to sacrifice some milk or butterfat production and returns from less exact feeding rates to individual cows—provided that the value of the labor is worth more than the sacrifice in milk or butterfat production returns. Some farmers bunk-feed their cows to save labor for this reason.

Other Means . . .

Other problems in dairy production can detract from profits and over-all efficiency. Among these is the time of freshening dates. Should your cows be bred to freshen in the fall for largest profits? Then you'd get the seasonal highest prices for the bulk of the production. Or should you plan for freshening in the spring to take advantage of spring and summer pastures? You may get a lower production cost this way, but you also get lower seasonal prices for the bulk of the production plus lower total yearly production since cows calving in the fall produce more milk and butterfat.

Again there's no answer that will fit all farms. You must balance the higher cost and higher butterfat prices for winter production against the possibly lower costs and lower butterfat prices for summer production. And, if you sell fluid milk, there are other factors to consider.

Another economic problem to decide is whether to raise or buy replacement stock for the herd. The real cost of raising replacements isn't the direct cost of feed and labor over a 2-year period. Rather, it's the "opportunity cost" of having feed, labor and capital tied up in the dairy heifers for 2 years. What could this feed, labor and capital have earned in other investments? More in poultry or hogs? Or more in dairy cows? These are the costs that should be compared



Deciding whether to keep a herd bull or to use artificial insemination is a problem for some dairy farmers. Besides the costs of each, there also are the risk and settling problems to be considered.

with the price of buying replacements.

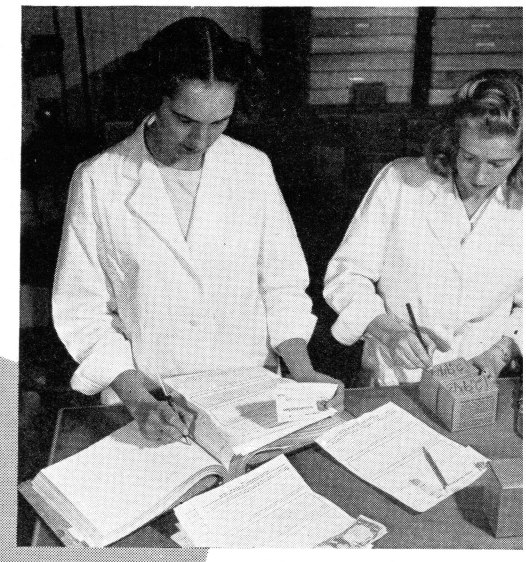
Besides this, there are risk factors to consider. You run the risk of introducing disease into your herd through purchased stock. And there may be some risk of sacrificing quality or producing ability through purchased stock—particularly where you know little about the production records of parent stock.

Some dairy farmers also have the economic problem of the relative costs of keeping a bull versus the use of artificial insemination. A recent study in Pennyslvania showed the annual feed, labor and bedding requirements of keeping a bull to be about as follows: 1,745 pounds of concentrates, 2.8 tons of roughage, 1 ton of bedding and 101 hours of labor. Ignoring other costs, this adds up to $180 against the artificial insemination service cost of $6 per cow; the latter would be cheaper, in herds up to 30 cows.

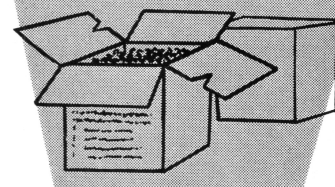
If the annual labor cost of keeping a bull is omitted and if such labor is valued at $80, artificial insemination would be less costly for herds up to 16 or 17 cows. In making the final choice, compare also such factors as the physical risks of keeping a bull and the problem of settling cows with artificial insemination.

Flexibility is another efficiency problem. How much flexibility should you have in your dairy enterprise? Should you expect considerable change in the relative prices for livestock in the future, you might logically base your plans for a new barn on providing flexible housing facilities. Converting a pen-type barn, for example, from one kind of livestock production to another can be done with little or no cost.

On the other hand, converting the standard stanchion-type dairy barn to other uses is practically impossible without major structural changes and considerable cost. Some farmers may desire flexible housing facilities to leave the way open for switching from one type of livestock production to another. Changes in the age of the operator, in his capital position and in the family labor supply may be additional reasons for making the dairy enterprise flexible.



Now, we can. . .



Test Your Soil for Nitrogen Needs

Development of a new method for testing the nitrogen needs of your soil enables the Iowa State College Soil Testing Laboratory to make more accurate recommendations for you. Here are the details about the new test.

by J. J. Hanway and R. C. Gray

THE IOWA STATE College Soil Testing Laboratory now has a soil test that will predict the nitrogen needs of your soil. Filling a need long evident in Iowa, the new test became a part of our regular soil testing procedure on May 1.

Soil tests to determine needs for lime, phosphorus and potassium have been available and used for years. But there has been no reliable test for nitrogen availability in soils.

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Fertilizer recommendations from the Soil Testing Laboratory have included recommendations for the use of nitrogen fertilizers. However, these have had to be general recommendations—based on the soil type, previous management, crop deficiency symptoms and knowledge of yield increases obtained from applications of nitrogen fertilizers under similar conditions. Now the recommendations can be much more specific for each sample tested.

Why No Test Before?

Almost all nitrogen in soils is in the organic matter present. Before such nitrogen can be used by plants,